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ABSTRACT

The drilling system includes a work string supporting a bottom hole assembly. The work string including lengths of pipe having a non-metallic portion. The work string preferably includes a composite umbilical having a fluid impermeable liner, multiple load carrying layers, and a wear layer. Multiple electrical conductors and data transmission conductors are embedded in the load carrying layers for carrying current or transmitting data between the bottom hole assembly and the surface. The bottom hole assembly includes a bit, a gamma ray and inclinometer instrument package, a propulsion system with resistivity antenna and steerable assembly, an electronics section, a transmission, and a power section for rotating the bit. The electrical conductors in the composite umbilical provide power to the electronics section and may provide power to the power section. The data transmission conduits in the composite umbilical transmit the data from the downhole sensors to the surface where the data is processed. The propulsion system includes two or more traction modules connected by rams disposed in cylinders for walking the bottom hole assembly up and down the borehole. The propulsion system includes a steerable assembly, controlled from the surface, for changing the trajectory of the borehole.